Extensor digitorum brevis manus: A case of fourth-compartment syndrome

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The presence of an extensor digitorum brevis manus represents a variation of the normal anatomy of the fourth extensor compartment of the wrist. It usually presents as a swelling on the dorsum of the wrist and is often inaccurately diagnosed. An awareness of its existence and of its characteristic appearance on diagnostic imaging studies is the basis for diagnosis. Symptomatic cases require division of the extensor retinaculum or excision of the muscle, depending on subtype, while asymptomatic cases require no intervention.

Key Words: *Anomalous extensors; Extensor digitorum brevis manus; EDBM; Fourth-compartment syndrome*

Un muscle extenseur commun court des doigts : Un syndrome de la quatrième loge

La présence d'un muscle extenseur commun court des doigts représente une variation de l'anatomie normale de la loge du quatrième extenseur du poignet. D'ordinaire, cette manifestation prend la forme d'un œdème du dos du poignet. Elle est souvent mal diagnostiquée. La prise de conscience de son existence et de son apparence caractéristique à la visualisation diagnostique constitue le fondement du diagnostic. En présence de cas symptomatiques, il faut diviser le ligament annulaire ou exciser le muscle, selon le sous-type, tandis que les cas asymptomatiques n'exigent aucune intervention.

The vast majority of variations of the extensor tendons of the hand are asymptomatic throughout life, but their importance in hand surgery has been documented (1-4). The variations are often found incidentally at the time of surgery and at the time of diagnostic imaging (5). On occasion they may be associated with dorsal wrist pain, but a direct correlation is often difficult in the presence of other pathology, such as a ganglion or synovitis (6-9).

First described by Albinus in 1734, as "muscles extensor brevis digiti indicis vel medii" (1), the existence of this anomalous muscle was questioned owing to its infrequent clinical presentation. Various anatomical descriptions persisted, but in 1866 Macalister (10) coined the term 'extensor digitorum brevis manus' (EDBM). The first clinical correlate was reported in 1926 (11). Since then, over 100 articles have been published on the topic leading to the development of two separate classifications. With incidences reported to be between 1% and 9% (11-16), the occurrence of this muscle should not surprise the anatomist or hand surgeon. In light of the high incidence and the lack of symptomatic case reports, the majority of EDBM cases must remain asymptomatic.

A case of EDBM in association with an intraosseous ganglion of the lunate as a cause of fourth-compartment syndrome is reported. A review of the literature and current imaging techniques are presented to underline the clinical implications of this anomalous extensor muscle.

CASE PRESENTATION

A 36-year-old, right-hand dominant woman was referred with left wrist pain after falling on her outstretched hand. The initial swelling and pain was managed with physiotherapy. However, the pain persisted over the central dorsal aspect of the wrist and she was unable to return to work. Although increased with most hand movements, the pain was worst with wrist flexion. There was no significant past medical history.

On examination, she had a normal resting posture and range of motion. Palpation found dorsal tenderness centrally over the lunate. There was also a dorsal soft tissue mass clinically suspected to be hypertrophied extensor tenosynovium.

Radiographs of the left wrist demonstrated a well-circumscribed lytic defect in the dorsal aspect of the lunate and a mild soft tissue swelling noted over the dorsum of the wrist.

An axial computed tomographic (CT) scan of both wrists was subsequently performed, that revealed two distinct findings; best seen on specific bone windows, the CT confirmed and better characterized the lytic lesion in the left lunate. The lesion, which measured 6×5×5 mm, did not demonstrate any aggressive features and had very fine sclerotic margins. However, it did have an area of breech of the cortex at the lunate triquetrial articulation dorsally.

Dedicated soft tissue windows also revealed an asymmetric soft tissue attenuation 'mass-like' area at the dorsal aspect of the left wrist. This area was at the level of the carpal bones. It appeared to be related to the extensor tendons/sheath, but not the lytic lesion in the lunate. The area was elongated, following the course of the extensor tendon sheath and was isoattenuating with surrounding muscles. (Figure 1).

Magnetic resonance imaging (MRI) confirmed the presence of a 7 mm subchondral cyst in the dorsal radial aspect of the left lunate. It also confirmed and better characterized the

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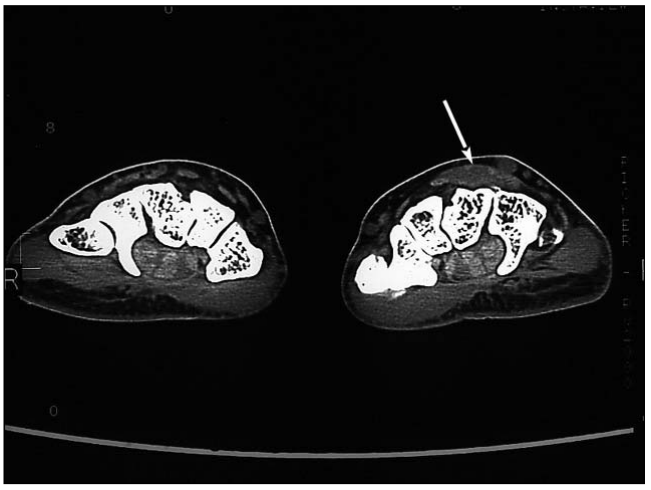

Figure 1) *Axial CT of both wrists. Asymmetric soft tissue attenuation "mass-like" area at the dorsal aspect of the left wrist (white arrow)*

1 cm soft tissue 'mass' visible along the extensor tendons of the index and long fingers. The apparent 'mass' was homogenous and iso-intense, with muscle on all sequences (intermediate to low T1 and T2 signal intensity) and did not demonstrate any enhancement; a classic finding for an anomalous muscle. The adjacent tendons were of normal size and signal. There was no other evidence of a discrete mass or any abnormal fluid accumulation. The imaging features and location were classic for EDBM (17) (Figure 2).

It was felt that both the lesion in the lunate and the extensor tenosynovitis could be responsible for the patient's symptoms. Unfortunately, nonoperative management with splinting and anti-inflammatory therapy failed. Extensor tenosynovectomy plus curettage and bone grafting of the lunate were recommended.

At the time of surgery, extensor tenosynovitis was seen around the fourth extensor compartment and a tenosynovectomy was undertaken. An anomalous muscle belly was found originating from the dorsal wrist capsule at the distal extensor retinaculum, deep to the extensor digitorum communis tendons and coursing distally to insert into the dorsoulnar extensor hood on the index finger. Extensor indicis proprius (EIP) was absent. Recognized as an EDBM, it was decided not to excise the muscle but to increase the calibre of the fourth extensor compartment via a stairstep lengthening of the extensor retinaculum. The lunate intraosseous ganglion was curetted and a distal radius bone graft was packed into the defect.

Follow-up demonstrated progressive ossification of the lunate defect. Wrist and digital range of motion and pain recovered with physiotherapy.

DISCUSSION

Gama (18) randomly examined 3404 adults and found 38 cases of EDBM for an incidence of 1.1%. Occurring bilaterally in one-third of the reported cases, EDBM shows no difference in incidence between the right and left hands or between sexes (12,18-20). Various descriptions of the origin of the muscle exist. It was best described by Ogura et al (20) as arising from the posterior radiocarpal ligaments near the lunate, as far proximal as the distal margin of the radius, and without direct attachment to the carpal bones. The muscle insertion is reported to be similar to that of the EIP (16). This suggests that the EDBM is derived from an extrinsic muscle. There are two classification systems at present, both based on the presence or absence of the EIP as well as the origin and insertion patterns (19,20).

Clinically, EDBM usually presents as a prominent, firm mass on the dorsal wrist that may be painful when the fingers are actively extended against resistance (13,18-22) or when the palm is pushed against a table with extension of the wrist (20). The diagnosis is most often confused with a dorsal wrist ganglion or synovial pathology. However, a ganglion, synovitis or other wrist pathology may coexist, as seen in this case. Differentiation from an anomalous EIP (aEIP) is more difficult, but according to Ritter and Inglies (23), extensor indicis proprious syndrome can be ruled out. In that syndrome, the aEIP is constricted by the extensor retinaculum as it passes distal to the fourth compartment in full wrist flexion. In constrast, the EDBM muscle belly lies distal to the distal edge of the extensor retinaculum and extends to the midpoint of the second and third metacarpals. Previously, direct electromyogram has been recommended to diagnose and subtype EDBM (24). The MRI appearance, including signal intensities and lack of enhancement, combined with the classic anatomic location are characteristic for EDBM. Thus, with MRI, it is possible to differentiate EDBM from a neoplasm or ganglion. Sub-typing of EDBM is difficult with MRI and this classification is of little practical importance. Surgery is usually for the relief of pain.

EDBM usually causes little or no pain, and in these patients surgical intervention should be avoided. Patient reassurance is often sufficient to relieve distress. The muscle should not be seen as an excess structure but as a synergistic component of the EIP when present or as compensation when the EIP is absent. Conservative treatment, such as short-wave diathermy, paraffin baths, immobilization and anti-inflammatory drugs, have been used with limited success (19,21,25). If the symptoms are severe and surgical intervention is warranted, then the classification can be made at the time of surgery based on the presence or absence of the EIP. In cases in which the EIP is completely absent, division or resection of the extensor retinaculum is recommended. Although division of the retinaculum may provide relief when the EIP is present, some authors (19) recommend excision of the EDBM leaving the EIP tendon intact. A case review found that 75% of patients required excision of the muscle belly if symptomatic (19).

A recent article proposed the new term, "fourth-compartment syndrome," to describe chronic dorsal wrist pain of the fourth extensor compartment (26). It listed the five main causes as ganglion, EDBM, aEIP, tenosynovitis and anomaly or deformity of the carpal bones. As opposed to the concept that the pain results from muscle belly compression, the authors suggested it may be due in part to compression of the posterior interosseous nerve either directly or indirectly.

Diagnosis of EDBM can be made clinically and confirmed with MRI. It should not be misinterpreted as a soft tissue tumour. At the time of surgery, management is determined by the presence or absence of an EIP. It involves the release of the fourth extensor compartment and in cases where an EIP is present, possible excision of the EDBM if further decompression is required.

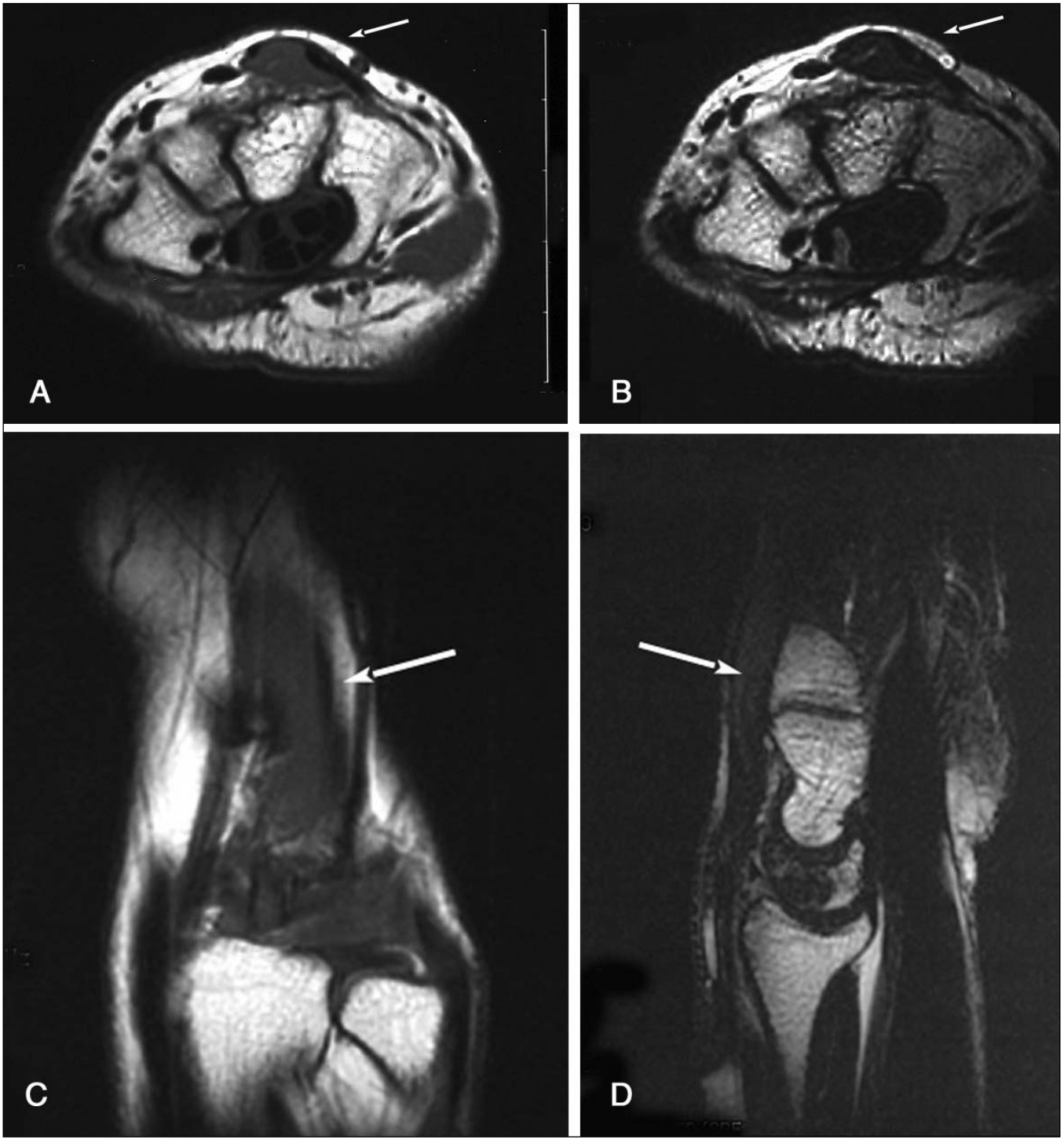

Figure 2) *Axial T1* **(A)** *and Axial T2* **(B)** *magnetic resonance imaging (MRI) of the left wrist, at the same level at the computed tomography (CT). Confirms that the 'mass-like' area is iso-intense with surrounding muscle and has a characteristic appearance and location of an anomalous muscle (white arrow); Coronal T1* **(C)** *and Sagittal T2* **(D)** *MRIof the left wrist, at the same level at the CT. Confirms that the 'mass-like' area is iso-intense with surrounding muscle and has a characteristic appearance and location of an anomalous muscle (white arrow)*

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